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A Weekly Summary of Current Science

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DISCOVER NEW VITAMIN THAT CONTROLS REPRODUCTION

A constituent of food, hitherto unrecognized, that animals must have before they can produce young has been discovered by Dr. Herbert Evans and Dr. K. Scott Bishop of the University of California. It occurs in lettuce and alfalfa, egg yolk and fresh meat, and as soon as Dr. Evans can establish its characteristics it will probably take its place in science as the fourth firmly established vitamin.

Unlike the other vitamin, this new dietary factor X, as it has been named, does not seem to affect the growth of the individual rat but its lack does prevent the mother rat from having offspring. Rats reared on the ordinary "purified" laboratory diet consisting of casein, cornstarch, and lard, with a little butterfat and salts, even when given ample quantities of the growing producing vitamins A and B, are sterile without exception, Drs. Evans and Bishop have found.

"It is startling to observe that fat, slick coated rats fed on this diet are sterile, but that when they are fed fresh green leaves of lettuce them immediately are able to produce full and normal litters of young," explained Dr. Evans who conferred with officials of the U. S. Bureau of Animal Industry on details of his work in cooperation with governmental dairy experts.

The experiments that demonstrated this new factor in food were carefully carried out so as to eliminate the possibility that the non-productiveness of the rats had any other cause. In most cases sister rats from the same litter were used. The one fed on the laboratory diet without lettuce remained consistently sterile, while the one that received the lettuce ration was always productive. By switching the diet, the opposite results could be obtained.

Dr. Evans explained that the new dietary deficiency that he has discovered does not prevent conception. The animals have the normal ovarian function and the egg cells are fertilized and implanted. But lack of the factor X causes the products of the conception to be absorbed before the gestation period is completed.

In normal life the infertility due to the lack of factor X is probably very slight, Dr. Evans said. When asked whether factor X influenced human reproduction, he pointed out that most sterility in women is due to inability of conception, but that in some cases sterility is produced even after conception is successful. It is remotely possible that a small percentage of these cases are due to factor X, he said.

The government experts in animal husbandry at the Department of Agriculture in Washington are extremely interested in Dr. Evans' results and they believe that factor X may explain cases of infertility in cattle that have puzzled them in the past. Experiments at the Beltsville, Md. experimental farm are planned.

Drs. Evans and Bishop have taken care to establish that none of the three known vitamins control reproduction and produce the effect of factor X.

In addition to fresh lettuce or alfalfa leaves, fresh meats and egg yolk, it has been found that the germ of wheat is rich in X. Orange juice, codliver oil, milk, cornstarch, sugars, lard casein contain no factor X and butter is very low in X content. Foods like milk, codliver oil and orange juice are rich in one or more of the previously known vitamins.

The necessity for another factor in food during reproduction is contrary to what would be logically expected, Dr. Evans said. An animal always injures itself to reproduce, he pointed out, and it would be plausible if there were fewer elements needed by the mother during pregnancy than during normal life. As an instance he cited the draining of calcium from the bones of the mother to provide this mineral constituent to the child.

There are probably many more vitamins in natural food, but until the discovery of factor X, only three have been commonly demonstrated and accepted. Lack of the anti-scorbutic vitamin, commonly called C, produce scurvy, which before the days of fresh vegetables and fruits on ships at sea decimated the English navy every year. The absence of the vitamin, Water-Soluble B, causes beri-beri, a disease of the nerves. A disease of the eyes is provoked by the lack of the third vitamin discovered in 1913, Fat-Soluble A, and its presence is necessary to the growth and normal development of young animals.

Two vitamins D have been announced in the past year. Dr. E. V. McCollum has so designated an anti-ricketic factor, different from A, by this letter. Casimir Funk gave the letter D to another vitamin that yeast contains in addition to B. This second yeast vitamin does not seem to play a part in mammalian physiology. Neither of these vitamins are fully accepted as yet and it seems probable that the dietary factor X will be considered the fourth established vitamin.

READING REFERENCE- Sherman, Henry C. Vitamins. (Monograph series) N.Y. Chemical Catalogue Co., 1922. Plimmer, V. G. and R. H. Vitamins and the choice of foods. N.Y. Longman, 1922.

COMETS NOT SPACE WANDERERS BUT BELONG TO SUN

All known comets are members of the solar system and are not vagrant wanderers from interstellar space, according to mathematical investigations made by Prof. Stroemgren, the royal astronomer of Denmark. After twenty-two years of research on this problem Stroemgren refutes the older belief that some comets drift in from the vicinity of other stars.

Until the time of Tycho Brahe, 350 years ago, comets were believed to be phenomena of the earth's atmosphere. Tycho Brahe succeeded in proving that they are celestial bodies, and mathematical astronomers later were able to compute the orbits around the sun. Comets were shown by Newton, Halley, and their successors to be governed by the universal law of gravitation.

The movements of comets, like those of the planets, are controlled by the sun. The gravitating power of the great amount of matter concentrated in the sun domi-

nates this region of space. Jupiter, Mars, Earth, and the other planets, however, seriously disturb the cometary motions. Astronomical calculations show that the orbits or paths of comets around the sun are elliptical, parabolic, or hyperbolic. Elliptical paths are closed; comets that travel in such orbits return from time to time to the neighborhood of the sun, where they become more luminous and may be observed. The parabolic and hyperbolic orbits are not closed, and comets travelling along these paths do not return to the solar system.

The new theory maintains, however, that all comets originally travelled in elliptical or closed orbits, periodically coming closer to the sun from the outer regions of the planetary system. It maintains that the material composing comets is a part of the original nebula out of which the sun and his family are thought to have formed. According to this theory, the disturbing influences of the planets have changed the orbits of some comets from the closed paths to the open form. That is, the perturbations by the planets have resulted in throwing some of the original material of the solar system off of its beaten track and out into the emptiness of interstellar space, never to return.

The planets have no difficulty in disturbing greatly the motion of a comet, as the amount of matter in a comet is extremely small. Although there is but little material in a comet's head, we frequently find it expanded, because of its great rarity, to enormous dimensions. Recent photographs made at the Harvard College Observatory show that Baade's comet has a volume nearly ten times that of the earth.

This faint comet is now outside the orbit of Mars, slowly receding from the sun.

READING REFERENCE- Elson, Henry W. Comets, their origin, nature and history. N.Y. Sturgis & Walton, 1910.

COLUMBIA PROFESSOR STAGES AN ISOTOPE RACE

Prof. James Kendall of Columbia University reports a new and ingenious method for separating atoms of the same elements having different weights. It used to be supposed that all the atoms of the same element had exactly the same atomic weight. But it has recently been discovered that this is not always true. Many of the elements are known to exist in more than one form, "isotopes" is the name given them.

Since the isotopes of an element have the same chemical properties it is not possible to separate them by chemical means, so they have hitherto escaped detection. What was known as the atomic weight was an average of the natural mixture of two or more atoms of different weights. Chlorine, for instance, was a puzzle, for its atomic weight figured out very close to 35.5 whereas it should have been a whole number, a multiple of the unit, hydrogen. But now we know that the chlorine atoms are of two sorts, one weighing 35 and the other 37, the two being mixed in minerals to average 35.5. But in order to separate them some physical means must be adopted.

One of Professor Kendall's methods is to fill a long tube with a jelly made of agar-agar containing salts in solution. In the middle is a short section containing chloride. When an electrical current is passed through the tube the chlorine moves slowly toward the anode. But since the chlorine atoms have different weights they may be expected to move with different speeds and after they have travelled a

hundred feet or so through the tubes the heavier should lag behind the lighter, so the front part of the chlorine section of the jelly will contain entirely one isotope and the back part entirely the other. This method may also be used for the separation of the rare earths which are so near alike in atomic weights and chemical behavior that it is a long laborious process to sort them out.

The practicability of the method has already been proved by running off preliminary heats with mixtures of two common substances, one of which was known to make slightly better time under the action of the electric current than the other. After the race had progressed only a few feet, chemical tests showed that a perfect separation had been effected. Unless, therefore, the heavy-weight chlorine atoms are capable of running a dead-heat with the light-weight chlorine atoms in spite of their handicap of avoirdupois (a possibility which is scarcely to be anticipated), a complete separation of isotopes will, for the first time in history, be accomplished.

Then we shall be able to reply, when someone asks us at the dinner table to pass the salt: Which kind of chloride would you prefer, the perfect 35 or the perfect 37?

PRODUCES APPLE ODOR BETTER THAN APPLES

Science has scored again on Nature. Dr. Frederick B. Power and V. K. Chestnut of the United States Bureau of Chemistry have discovered how the apple makes its odor and have created an odor which the apple itself would mistake for its own product.

In fact they have purloined the apple's own formula and are able to turn out the manufactured article in quantities with which the apples can not compete. They found that it took twenty-four bushels of Ben Davis apples to produce one gram of the oil which causes the odor of that fragrant fruit. From one hundred pounds of the apple peelings they got a few globules of the oil, analyzed it, found the chemicals of which it was composed, and set about building up from such chemicals an oil which has the characteristic fragrance of ripe apples.

This synthetic oil, they claim, can be used profitably to furnish an apple flavoring extract for soft drinks.

The investigators found that the odorous constituents consist principally of the amylesters of formic, acetic, and caproic acids with a very small amount of the caprylic ester and a considerable proportion of acetaldehyde. These substances occur in mixtures of varying proportions in the numerous varieties of apples, giving rise to slight differences of odor and of flavor.

Hard tack, similar to the war biscuit furnished modern armies, was an article of food for the Roman soldiers during the second and third centuries, A. D.

Large amounts of California rice were recently imported into Japan.

Certain species of hawks fly at a speed of 200 feet a second, or about 136 miles an hour.

Fully 90 per cent. of the pumps imported for farm use in South Africa come from the United States.

OIL TREATMENT LESSENS ELECTRICAL EXPLOSION

Danger of explosions in large electrical transformers has been largely eliminated through an improvement made by Walter M. Dann, engineer in the Westinghouse Electric and Manufacturing Co. laboratories at East Pittsburg.

The oxygen ordinarily in the oil is removed and the dielectric or non-conducting efficiency is consequently improved.

"Oil contains oxygen in solution," Mr. Dann, explained. "Oxidation in the transformers has been unavoidable hitherto. A smudge has formed on the transformer tubes, with consequent resulting loss of cooling radiation. The oxygen-free oil acquires no smudge and loses none of its dielectric efficiency. On the contrary, there is an improvement in it up to a certain maximum."

Air from which hydrogen and oxygen have been removed by ordinary methods is forced into the transformers and acts as an absorbent of the oxygen in solution in the oil. It is stated that the oil will be more efficient after ten years of use than when first put in.

IMITATION WOOL MADE FROM COTTON

The large French textile concern, Societe Gillet et Fils, has developed a process for making an imitation wool from cotton, according to information reaching New York. The process has also been patented in the United States.

Wool is an animal fiber, derived from the sheep, while cotton is a vegetable fiber, grown in the fields. These two fibers, so different in origin, also differ essentially in their structure and sensible properties, so that they can be rather easily told apart in the yarn. But when they are woven into fabrics and especially when a woollen cloth contains some cotton, it is a difficult matter to determine which is which. Thus, only those expert in textiles can tell definitely whether a fabric is all wool or not by the mere feel of the goods. The chemist can detect the presence of cotton in wool under the microscope. When the two fibers are examined individually, the burning test indicates wool by the characteristic odor of burning feathers.

The new process of making imitation wool from cotton effects a change in the fiber, so that cotton also burns with the odor of burning feathers. This peculiar odor is due to the presence of the element nitrogen in the form of protein matter in the wool. When the twisted cotton fiber, which has the property of absorbing and holding fast liquids even when subjected to vigorous washing, is treated with a solution of protein in the partially decomposed state, the cotton is converted into an "artificial wool".

The process is simple. A solution of glue or gelatine, egg albumen or casein is first partially broken down by acid and then the cotton fabric or yarn is impregnated with it. By varying the temperature, the time of immersion and the proportions and nature of acid or protein, the degree of conversion can be regulated within wide limits. After the cotton fiber has absorbed the protein, it is removed from the bath and washed with water. This has the effect of precipitating the protein on the fiber in an insoluble condition. As the solution has penetrated into the internal structure of the cotton, this results in the latter being

completely filled with insoluble protein matter, which cannot be removed under ordinary conditions.

The process is applicable to vegetable fibers other than cotton. Either the yarn or the finished cloth can be treated with equally good results. Mercerized cotton cloth can also be converted by this process, as the mercerization has no effect on the ability of the fiber to absorb the protein solution.

"Artificial wool" has characteristic properties of natural wool. It resembles the latter so closely that the burning test can no longer be used to tell whether the fiber is real wool or not. Increased strength, good wearing qualities, a certain amount of waterproofing are claimed for this new fiber.

READING REFERENCE: Beaumont, R. Wool substitutes. N. Y. Pitman 1922.
Ormerod, Frank, Wool. London, Constable & Co. 1918.

(A Chat on Science)

THE ANCESTRAL SCANDALS OF SCIENCE

By Edwin E. Slosson

Tracing back the history of a science is like searching out a genealogy; one is sure to unearth something scandalous if he goes back far enough. John G. Saxe warned the would-be ancestor worshiper of this danger in the familiar lines:

"Depend upon it, my snobbish friend,
Your family thread you can't ascend,
Without good reason to apprehend
You may find it waxed at the farther end
By some plebeian vocation!
Or, worse than that, your boasted line
May end in a loop of a stronger twine,
That plagued some worthy relation!"

The chemist handles with reverent awe the latest unearthed and earliest written text of his science, a scrap of Egyptian papyrus, but when he gets it translated he finds it is a counterfeiter's recipe, a method of making base metals look like gold. Or else it is a recipe for cosmetics which is also a form of counterfeiting.

The astronomer finds in a Babylonian brick the first record of the stars but discovers to his disgust that the cuneiform inscription is an astrological treatise, a fortune-teller handbook.

Hero of Alexandria described the turbine steam-engine, the coin-in-a-slot machine and other valuable inventions. But what were they invented for? So the priests of the temple of Isis could perform fake miracles.

Pythagoras discovered the law of the hypotenuse - and was so happy over it that he killed a hundred oxen. It is hard for us to see why. But mathematics was

to him a form of magic, otherwise he would not have been interested in it.

Paracelsus did much to advance medicine. We cannot yet dispense with the three drugs he introduced, mercury, opium and antimony. But Paracelsus's real name was Bombast - and he lived up to it.

It is humiliating to confess but the progress of science in its early days owed much to the false pretensions of its practitioners. Kings would not have kept a corps of men studying the stars unless they had proffered practical returns in the way of auguries. Chemists were subsidized for centuries because they promised the philosopher's stone and the elixir of life - promises not yet fulfilled.

Columbus would not have ventured to cross the Atlantic if he had not been wrong in his figuring about the size of the earth and his royal backers would not have put up the money for the voyage if he had not told them wrongly that he could reach India that way.

Ponce de Leon was led to Florida by his search for a mythical Fountain of Youth. Coronado explored the Kansas plains to find the fabulous Seven Cities of Cibola. The vain search for the impracticable Northwest Passage to Asia was the stimulus to exploration for a century.

Fortunately for the world, fictitious aims may lead to real results. The scientist has learned how to achieve greater miracles than he ever pretended to perform. Truth has grown up under the shadow of error as infant oaks get their start under the shelter of worthless weeds. In chasing a will-o-the-wisp one may catch sight of a fixed star. Falsity has often served as a guide to Truth.

If the alchemist and the astronomer had been frank with their royal patrons and said: "No, we cannot promise you gold from lead, or everlasting life, or the power of reading fate in the stars, but if you will grubstake us and our successors for two thousand years we may be able then to tell you the size of the universe and the structure of the atom," they would have been laughed at instead of getting a share of the king's bounty. Even were they to have added the further promise: "If given a chance to devote our lives to science we will, beside said increase of human knowledge, throw in dynamos, bridges, coal-tar dyes and the like," still the ancient monarchs, being near-sighted, like all men, would have refused to come down with the cash for the benefit of a remote posterity.

But science nowadays can show such practical profits that it is beginning to get funds for research without pretending to do more than it knows it can. Science can safely promise rich rewards for money spent in its advancement, but it cannot say when or in what coin the world will get dividends on such investment in futures.

✓ READING REFERENCES- Gibson, C. R. Romance of scientific discovery. Phila. Lippincott, 1913. Rowbotham, F. J. Story lives of great scientists. N.Y. Stokes, 1918.

Although anthrax carrying wool can be disinfected successfully, no method has yet been devised whereby hides and skins can be effectively treated without damaging them.

TEST COW'S EFFICIENCY IN AIR-TIGHT STALL

Jan. What does a cow do with her food? By placing cattle in the only instrument in the world suitable to accurately measure the consumption and use of various kinds of feed, the Institute of Animal Nutrition of the Pennsylvania State College expects to have the answer to this question in about ten years. The experiment will probably take thirty years to complete and has now been in progress for twenty-one years. Several years will be required to compute the deductions from the data already gathered.

The instrument used is called the "respiration calorimeter" and consists of an air-tight stall built on much the same principle as a thermos-bottle, except that dead air spaces instead of vacuum prevent the loss of heat. The cow is placed in this box, where she leads a normal existence for two days, during which careful analysis is made of the food, water, and air, used by her, and the heat, work, excretions, gases, and milk she produces. By subtracting the energy in the excreta, measured in heat units, from the energy in the food given the cow, and by measuring the energy given off by the cow in the form of heat and milk, it is possible to determine what part of the food is going into the development of new tissue.

In the case of steers, it has already been found that 24 per cent. of the energy of timothy hay is available for fattening the animals while they only use 17 per cent. of the energy of alfalfa hay.

The experiments that will eventually extend over a third of a century were begun in 1901 by Prof. Henry P. Armsby, who died in 1921, and they are being continued by Prof. Jons A. Fries.

READING REFERENCE- Lindsey, J. B. Nutritive value of cattle feeds. 3pts. Mass. Agric. Exper. Station, Amherst, 1920. McCandlish, A. C. Feeding of dairy cattle. N.Y. Wiley, 1922.

ENGLISH METAL EXPERT TO TOUR THIS COUNTRY

Dr. Walter Rosenhain, head of the metallurgical department of the National Physical Laboratory at Teddington, England, will arrive in this country shortly for a lecture tour under the auspices of the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers. He will tell leading technical organizations and universities about the results of the research work which is being carried on under his supervision. "Solid Solutions" will be the subject of one of his principal addresses. His itinerary will begin at Lehigh University on February 14 and will close at Washington, D. C., April 5.

The Spanish Government at one time forbade the export of platinum from South America and ordered it thrown into the sea to prevent its use as an adulterant for gold.

The average yield of corn per acre varies in the United States from 14.8 bushels in Florida to 47 bushels in Connecticut.

AMERICAN RADIO AMATEUR HEARD ACROSS PACIFIC

The first signals from an American amateur radio station have crossed the Pacific. A radio operator on board a ship only 120 miles off the coast of China has reported to the American Radio Relay League that he picked up the signals of several members of that organization.

This achievement reinforces the successful trans-Atlantic radio tests in which 316 American amateur stations were heard in England. These are steps toward the amateur radio communication around the world.

ECLIPSE RESULTS SHOWN BUT THEY ARE ANTS

Results of the Crocker eclipse expedition of the Lick Observatory that went to Australia last fall to test the Einstein theory have arrived at Harvard College Observatory, But they are entomological, not astronomical.

Glass vials filled with ants, termites and ant lions collected by Dr. Robert Trumpler, of the Lick Observatory, near Wollal and Broome, Australia, are on exhibition. One of the ants appears to be a new species and among the names suggested for it is: Relativitus.

READING REFERENCE: Dunbabin, T. Making of Australia. N. Y. Macmillan 1922.
Fabre, J. H. C. Fabre's book of insects. N. Y. Dodd, 1921.

PREHISTORIC FINDS DWINDLE ON INSPECTION

Reports of city streets and railroad banks covered with the finest implements of prehistoric man, claimed to have been found in Central Germany by Otto Hauser, famous explorer, aroused the curiosity of archaeologists. and Dr. Wiggers went to the scene of the discovery. Now he is back in Berlin and says that the supposed archaeological sites were explored years ago and that the so-called Rough Stone implements show no indication that ancient man ever had anything to do with them.

MALARIA ON INCREASE IN RUSSIAN PROVINCES

One-tenth of the entire population of 300,000 in the German Community in the Volga were recently treated for malaria, advices received by the Health Section of the League of Nations show. This is but a sample which indicates how wide and increasingly virulent the disease is becoming in Russia.

TABLOID BOOK REVIEW

THE OUTLINE OF SCIENCE - Edited by Sir Arthur Thomson. G. P. Putnam's Sons, New York. (Four volume edition, \$18).

This is exactly the sort of book the broadminded, careful parent will hand to son and daughter of high-school age with the admonition, "Here is just what you should read." He will call attention to the book's completeness, its beautiful pictures, its studied determination to be interesting. Son and daughter, to whom the world is relatively new and unknown, will probably devour such parts of it as school work has not already spoiled for them.

Older readers may find it faulty in its haphazard arrangement of chapters, its over-emphasis on British authors and scenes and in its occasional lapses from orthodox science as in admitting Sir Oliver Lodge's vagaries on psychical phenomena. But in the main this is an admirable work, not only the best but really the only comprehensive survey of the various fields of modern science.

When a warm rain occurs over a snow-covered region it is not the rain so much as the warm wind that melts the snow. An inch of rain at 50 degrees F. could melt only three inches of light new snow or one inch of old snow.

The practice of hybridizing to produce new varieties of plants was first used in Europe by the Romans, who bred races of roses by its means.

Clear ice taken from polluted water may in some cases contain as low as one per cent. of the number of bacteria present in the water.

Free medical advice by radio is furnished to ships at sea by the U. S. Public Health Service.

The city of Calais, France, has started a municipal dairy and dairy farm, the milk from which is to be tested by health officers and the cows fed scientifically to keep the quality up to that prescribed for young babies.

Dutch threshing machines are designed to preserve, as far as possible, the length of the straw, which is used in making strawboard.

Ninety-eight bushels per acre is the average yield of potatoes in the entire United States for the past ten years.

The automobile is responsible for over one-sixth of the accidental deaths in the United States.
